STIMULATING THE COMPLICATIONS OF DIGITAL DIVIDE FOR SUSTAINABLE ADULT EDUCATION IN A DEVELOPING COUNTRY

Kofo Aderogba, Ph.D.[1]
Kunle Adeniyi, Ph.D.[2]
Bimpe Alabi[3]

ABSTRACT: **T**here are gaps between those that are able to benefit from the internet and those who are not. There have been powerful global movements, including a series of intergovernmental summits, conducted to close the digital divide. The movements formulated solutions in public policy, technology design, finance and management that would allow all connected citizens to benefit equitably as a global digital economy spreads into far corners of the world population. But the gap remains unabated in the Developing World. This work identified major attributes of the Developing World vis-a-vis the digitalization of the community; and examined the specific impacts of the digital divide on contemporary adult education and its future. Nigeria is used as a case study. The study made commendations for eliminating digital divide to propel advancement in adult education in the Developing World. The study is descriptive. Government policies and programmes on Internet and Telecommunication Technology (ICT) were examined. School programmes and practices on ICT were studied. 25 individual adults drawn across Nigeria were interviewed to determine their level of digital literacy, and challenges. They also made suggestions. The Third World are least connected with no indications for immediate integrated closure. Low literacy, poor economy, poor infrastructures and government ineptitudes, among others, constitute major reasons for the divide. Massive investment in ICT and infrastructures, and tremendously purposeful training of facilitators that will impart the knowledge and skills are desirable. Schools and colleges may have to double the attentions to ICT in their curriculums.

Keywords: digital divide, ICT, developing world, sustainable adult education

The global digital divide describes global disparities, primarily between developed and developing countries regarding access to computing and information resources such as the Internet and the opportunities derived from such access (Ali, 2011; Lu, 2001). As a smaller unit of analysis, this digital gap describes a large inequality that exists on a global scale. The Internet is known to be expanding fast, but not all countries, especially developing countries, can keep up with the constant changes. The term does not necessarily mean that someone does not have technology; it could mean that there is simply a difference in technology. These differences can refer to, for example, high-quality computers, fast Internet, technical assistance, or telephone services. The difference between all of these is also considered a gap.

Undoubtedly, there are gaps between those that are able to benefit from the internet and those who are not. There have been powerful global movements, including a series of intergovernmental summits, conducted to close the digital divide. The movements formulated solutions in public policy, got involved in technology design, finance and management that should allow all connected citizens to benefit

[1] Department of Adult Education, TASUED, Ijagun, Ijebu-Ode, Nigeria. kofoaderogba@yahoo.com
[2] Department of Adult Education, TASUED, Ijagun, Ijebu-Ode, Nigeria. akunleniyi@yahoo.com
[3] Department of Adult Education, TASUED, Ijagun, Ijebu-Ode, Nigeria. raregemaa@yahoo.com

equitably as a global digital economy spreads into far corners of the world population. But the gap remains unabated.

Specifically, for example, there is large inequality worldwide in terms of the distribution of installed telecommunication bandwidth. In 2014 only three countries (China, United States of America (US), and Japan) hosted 50% of the globally-installed bandwidth potential (Hilbert, 2016), (see Figure 1). This concentration is not new, as historically only ten countries have hosted 70-75% of the global telecommunication capacity. The U.S. lost its global leadership in terms of installed bandwidth in 2011, being replaced by China, which hosts more than twice as much national bandwidth potential in 2014 (29% versus 13% of the global total) (Hilbert, 2016).

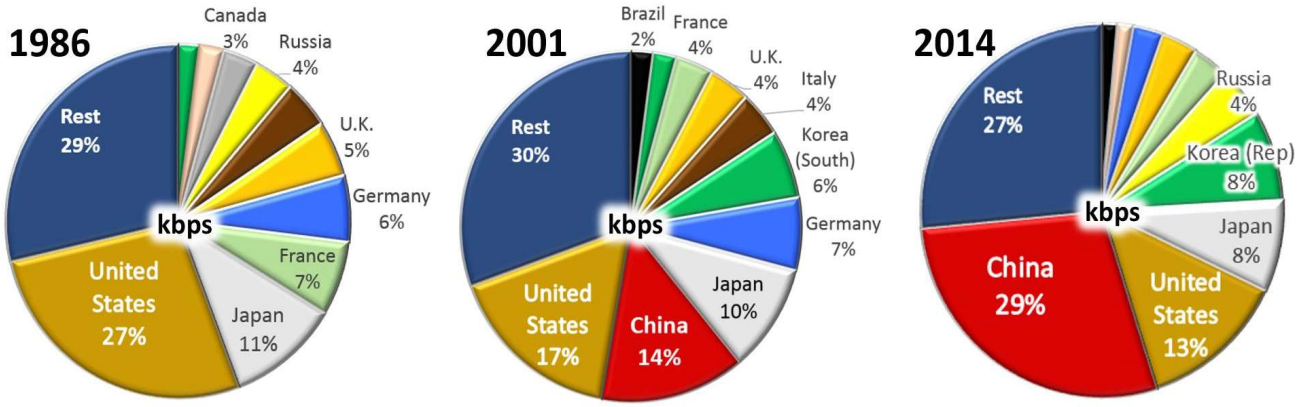

Figure 1: Top Ten countries with most installed bandwidth (in kbps)
Source: Hilbert (2016).

The global digital divide also contributes to the inequality of access to goods and services available through technology. Computers and the Internet provide users with improved education, which can lead to higher wages. The society living in nations with inadequate access are thus underprivileged (Ali, 2011; Krueger, 1993). This global divide is often considered as falling along what is sometimes termed the North-South divide of "northern" wealthier nations and "southern" poorer nations. See Tables 1 and 2, and Figure 2: Worldwide Internet users, Internet users by region, and Internet users in 2015 as a percentage of a country's population respectively. The world development closely follows the pattern.

Table 1

Worldwide Internet users

Year	2005	2010	2017	2019*
World population (In Billions)	6.5	6.9	7.4	7.75
Users worldwide	16%	30%	48%	53.6%
Users in the developing world	8%	21%	41.3%	47%
Users in the developed world	51%	67%	81%	86.6%

Note: * It is an estimate

Sources: International Telecommunication Union (ITU) (2019); U.S. Census Bureau (2004).

Table 2

Internet users by region

Region	2005	2010	2017	2019*
Africa	2%	10	21.8%	28.2%
Americas	36%	49%	65.9%	77.2%
Arab States	8%	26%	43.7%	51.6%
Asia and Pacific	9%	23%	43.9%	48.4%
Commonwealth of Independent States	10%	34%	67.7%	72.2%
Europe	46%	67%	79.6%	82.5%

Note: * It is an estimate

Source: International Telecommunication Union (ITU) (2019); U.S. Census Bureau (2004).

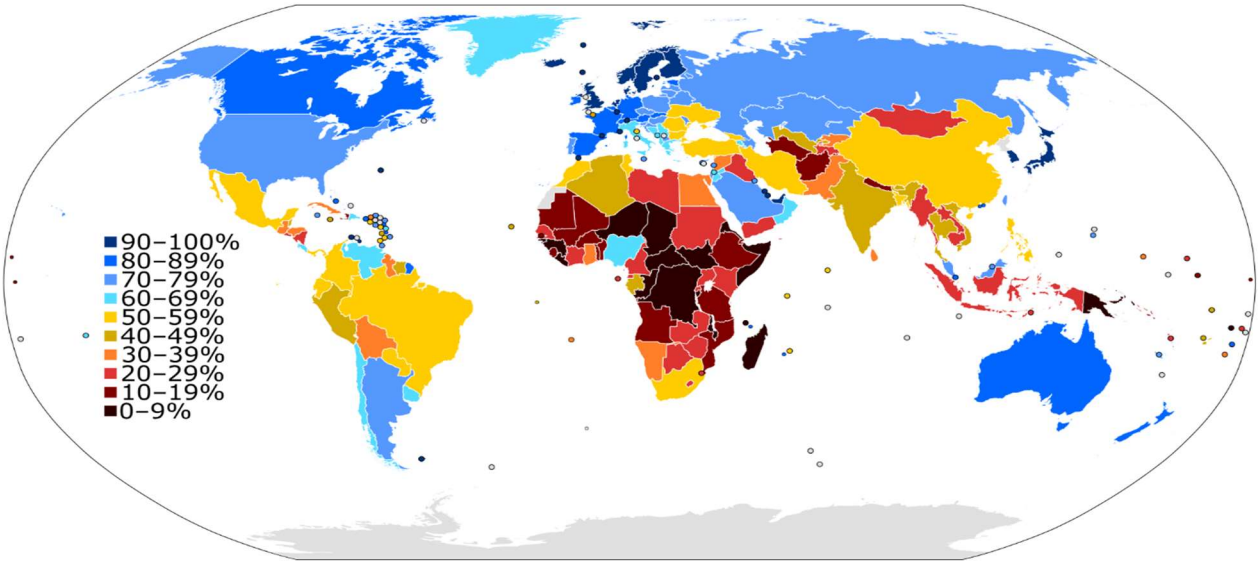

Figure 2: Internet users in 2015 as a percentage of a country's population
Source: International Telecommunications Union (2013).

The low connectivity is negatively skewed to Africa, see Figure 2; and Africa is the least developed compared to other nations and continents of the world. The gaps are still there, almost a decade later; Africa remains a "dark continent," and backward in digital development in particular. These impact and reflect in the community's social capacity, economic disparity, demographic differences and education (ITU, 2019; McLaughlin, 2016; Yung, 2017).

Specifically, on education, the digital divide impact the ability to learn and grow in low-income school communities. Without Internet access, learners are unable to cultivate necessary tech skills in order to understand contemporary dynamic economy, instructor/lecturers cannot give learners homework that demand access to broadband, learners cannot use the Internet to complete assignments as well as connect with teachers and other learners via discussion boards and shared files, and many could not get a computer to use (McLaughlin, 2016). According to McLaughlin (2016), this has led to a new revelation: 42% of students say they received a lower grade because of this

disadvantage; and he concluded that for United States of America "if the United States were able to close the educational achievement gaps between native-born white children and black and Hispanic children, the US economy would be 5.8 percent, or nearly $2.3 trillion, larger in 2050".

Suffice to say, however, that all levels and aspects of education have been adversely affected. Adult education, particularly in the developing world have been massively impacted (Aderogba, 2015, 2020; Yung, 2017). This explains why this work is desirous of the examination of the challenges and complications of digital divide on adult education in the developing world and makes recommendations for bridging the gap to engender sustainable adult education.

Objectives and Research Questions

The objectives of this work are to examine the challenges and complications of digital divide on adult education in the developing worlds; and to make recommendations for sustainable digitalization that will bridge the gap in a spate of time and for sustainable adult education. In order to pursue the objectives, the following research questions were answered:

- What are the salient attributes of the Developing World vis-à-vis digital divide in the communities?
- What are the specific impacts of digital divide on adult education in the Developing World?
- In specific terms, what are the strategies that could be put in place to bridge the digital divide that will propel advancement in sustainable adult education in the Developing World?

Nigeria, the most populous country in Africa is chosen for study.

Concepts of the Digital Divide and the Developing World

On the Digital Divide

Though originally coined to merely refer to the matter of access, that is, who is connected to the Internet and who is not, the phrase digital divide has progressed to emphasize on the division between those who are benefited by the Internet and those who are not (Pursel, 2020). Accordingly, the aim of “closing the digital divide” now refers to efforts to provide meaningful access to internet infrastructures, applications and services. The issue of closing the digital divide today comprises the matter of how emergent technologies such as artificial intelligence, robotics and internet of things (IoT) can help societies (Lee, 2018). As it has become clear that the internet can harm as well as help citizens, scholars studying the digital divide have focused on the matter of how to generate "net benefit" (optimal help minimal harm) as a result of the impact of spreading digital economy (Campbell & Brown, 2003; Simon, 2015).

The ethical roots of the matter of closing the digital divide can be found in the notion of “social contract,” in which there are advocates who state that governments should intervene to ensure that any society’s economic benefits should be fairly and

meaningfully distributed (Bukht & Heeks, 2018). According to Bukht & Heeks (2018), amid the Industrial Revolution in Great Britain, this advocated idea helped to rationalize poor laws that created a safety net for those who were harmed by new forms of production. Later when telegraph and postal systems evolved, many used the ideas to argue for full access to those services, even if it meant high levels of subsidizing to serve citizens. Consequently, "universal services" referred to innovations in regulation and taxation that would allow phone services such as AT&T in the United States work hard to serve and oblige rural users. In 1996, as telecommunications companies merged internet companies, the United States' Federal Communications Commission adopted the Telecommunications Services Act of 1996 to consider regulatory strategies and taxation policies to close the digital divide. This subject rapidly moved onto a worldwide stage. The focus was the World Trade Organization (WTO) which approved a Telecommunications Services Act (TSA), which resisted regulation of ICT companies so that they would be required to serve hard to oblige individuals and communities. In an effort to moderate anti-globalization forces, the WTO hosted an event in 1999 in Seattle, USA, attended by Chief Executive Officers of Internet companies, United Nations' Agencies, Prime Ministers, leading international foundations and leading academic institutions. It was the catalyst for a full-scale global movement to close the digital divide, which swiftly spread to all sectors of the global economy (Smith, 2002).

The "digital divide" is similarly refered to by a variety of other terms which occasionally have similar meanings, though with slightly different emphasis: digital inclusion, digital participation, basic digital skills, media literacy, and digital accessibility (Bukht & Heeks, 2018; Smith, 2002). A United States-based nonprofit organization (National Digital Inclusion Alliance), found the term "digital divide" to be awkward, since there is an array of divides. Instead, it elected to use the phrase "digital inclusion," providing a definition that refers to the activities necessary to ensure that all individuals and communities, including the most disadvantaged, have access to and use of Information and Communication Technologies (ICTs). This consists of (1) affordable, robust broadband internet service; (2) internet-enabled devices that meet the needs of the user; (3) access to digital literacy training; (4) quality technical support; and (5) applications and online content designed to enable and encourage self-sufficiency, participation and collaboration (Boles, 2018; Bukht & Heeks, 2018).

The divide between differing countries or regions of the world is referred to as the global digital divide, examining this technological gap between developing and developed countries on an international scale (Ali, 2011; Chinn & Robert, 2004). According to Chinn, & Robert (2004) and Ali (2011), the divide within countries (such as the digital divide in the United States) may refer to disparities between individuals, households, businesses, or geographic areas, usually at different socioeconomic levels or other demographic categories.

Nevertheless, studies show that the digital divide is more than just an access issue and cannot be alleviated merely by providing the necessary equipment. There are at least three factors at play: information accessibility, information utilization, and information receptiveness (Aqili & Moghaddam, 2008; Chinn, & Robert, 2004; Zelenika, & Pearce,

2013). More than just accessibility, individuals need to know how to make use of the information and communication tools once they exist within their communities (Mun-cho & Jong-Kil, 2001). Information professionals have the ability to help bridge the gap by providing reference and information services to help individuals learn and utilize the technologies to which they do have access, regardless of the economic status of the individual seeking help (Aqili & Moghaddam, 2008; Zelenika & Pearce, 2013).

Nigeria, an example of the developing world

The United Nations (2003) admits that it has "no established convention for the designation of 'developed' and 'developing' countries or areas." According to the organisation, the designations "developed" and "developing" are intended for statistical convenience and do not necessarily express a judgement about the stage reached by a particular country or area in the development process (United Nations, 2003, 2014). It implies that developing countries are those not on a strongly definite list of developed countries. That is, there is no established convention for the designation of "developed" and "developing" countries or areas in the United Nations system. In common practice, Japan in Asia, Israel in the Middle East, Canada and the United States in North America, Australia and New Zealand in Oceania, and Europe are considered "developed" regions or areas. In international trade statistics, the Southern African Customs Union is also treated as a developed region and Israel as a developed country; countries emerging from the former Yugoslavia are treated as developing countries; and countries of eastern Europe and of the Commonwealth of Independent States (that is, the former Soviet Union) in Europe are not included under either developed or developing regions (United Nations, 2013a). Certain countries that have become "developed" in the last two to three decades by almost all economic metrics, still insist to be classified as "developing country" as it entitles them to a preferential treatment at the World Trade Organization (WTO). These include Brunei, Hong Kong, Kuwait, Macao, Qatar, Singapore, and the United Arab Emirates that have been cited and criticized for the self-declared status (The White House, 2019).

Still, under other norms, some countries are at an intermediate stage of development, or, as the International Monetary Fund (IMF) put it following the fall of the Soviet Union, "countries in transition". These include all those of Central and Eastern Europe (including Central European countries that still belonged to the "Eastern Europe Group" in the UN institutions); the former Soviet Union (USSR) countries in Central Asia (Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan and Turkmenistan); and Mongolia. By 2009, the IMF's World Economic Outlook grouped countries as advanced, emerging, or developing, depending on: per capita income level; export diversification; and the degree of integration into the global financial system" (International Monetary Fund, 2020).

According to the United Nations Conference on Trade and Development (UNCTAD) (2012), along with contemporary level of development, countries can also be classified by how much their level of development has changed over a specific period of time. In the 2016 edition of its World Development Indicators, the World Bank made a decision to no longer distinguish between "developed" and "developing" countries in the arrangement of its data, considering the two-category distinction outdated. Instead, it

classifies countries into four groups, based on Gross National Income per capita, re-set each year. The four categories in US dollars were: Low-income countries ($1,035 or less); Lower middle-income countries ($1,036 to $4,045); Upper middle-income countries ($4,046 to $12,535); and High-income countries ($12,535 or more) (World Bank, 2019). All definitions are not universally agreed upon. There is also no clear agreement on which countries fit any category (United Nations, 2013b; World Bank, 2015). A nation's GDP per capita, compared with other nations, can also be a reference point. In general, the United Nations accepts any country's claim of itself being "developing."

Irrespective of the controversies and insinuations, African nations and indeed Nigeria belong to the group of a developing country (or a Low and Middle-Income Country (LMIC), a less developed country, a Less Economically Developed Country (LEDC), Medium-industrialized country or an underdeveloped country). It is a categorization of countries with less developed industrial base and low Human Development Index (HDI) relative to other countries (O'Sullivan & Sheffrin, 2003). There has not been any claim to state otherwise.

Methodology

The study is descriptive. Primary and secondary data and information were used. Government policies and programmes on Internet and Telecommunication Technology (ICT) were examined. School programmes and practices on ICT were studied. 25 individual adults (15 males and 10 females) drawn from across the country, Nigeria, were interviewed to determine their level of digital literacy, and challenges. They rated the factors of digital divides on a six-level Likert Scale of “Very High,” “High,” “Average,” “Low,” “Very Low” and “Unacceptable.” Similarly, the severity of the impacts of the digital divide on adult education were measured. They also expressed their views about “digital divide” in the country. Similarly, five adult education centers were visited and the available digital facilities and amenities for teaching and learning were examined. In the same vein, six teachers of adult education, one each from each geopolitical region (Northwest, Northeast, Southwest, Middle Belt, South-South and Southeast), were interviewed on the curriculums they operated, the facilities and amenities and the challenges of digital divide on teaching and learning in their respective regions. They all made useful suggestions for timely closure of digital divide in the developing world. The over fifty years of combined experience in the industry and the situational knowledge and understanding of the authors of the environment were also brought to bear.

The interviews were conducted in July and August 2020 when the COVID-19 pandemic was prevalent and social distancing was mandatory (CDC, 2020; NCDC, 2020). Also considering the cost and risks of traveling in the country, the interviews were conducted through telephone.

Suffice to say that the data and information collected through these sources were coherent and robust enough for the objectives set and for the inferences drawn. Tables, six-step Likert Scales, and in-depth analysis were applied for data analysis and presentation.

Findings and Discussion

There are inequalities between individuals, households, businesses, or geographic areas, usually at different socioeconomic levels or other demographic categories. There are obstacles to accessibility: physical access, financial access, socio-demographic access, cognitive access, design access, institutional access, political access,and cultural access. They constitute barriers to digital inclusion. Table 3 explains how the obstacles constitute the divide.

Table 3

Causes of digital divide

Obstacles	Details
Physical Access	It involves "the distribution of ICT devices per capita; and telephone per families". Individuals need to obtain access to computers, telephone lines, and networks in order to access the Internet. This barrier is addressed in Article 21 of the convention on the Rights of Persons with Disabilities by the United Nations.
Financial Access	The cost of ICT devices, traffic, applications, technician and facilitator/educator training, software, maintenance, and infrastructures require ongoing financial means. Financial access and the levels of household income play a significant role in widening the gap
Socio-demographic Access	Educational levels and income are the most powerful explanatory variables, with age being a third one. Gender Gap in access and usage of ICT exist, due to unfavorable conditions concerning employment, education and income and not to technophobia or lower ability. Women with the prerequisites for access and usage turned out to be more active users of digital tools than men. Several socio-demographic characteristics foster or limit ICT access and usage.
Cognitive Access	In order to use computer technology, a certain level of information literacy is needed. Further challenges include information overload and the ability to find and use reliable information.
Design Access	Computers need to be accessible to individuals with different learning and physical abilities including certain compliance requirements such as with Section 508 of the Rehabilitation Act as amended by the Workforce Investment Act of 1998 in the United States of America, for example.
Institutional Access	This can be best illustrated as the numbers of users are greatly affected by whether access is offered only through individual homes or whether it is offered through schools, learning centers, community centers, religious institutions, cybercafés, or post offices, especially in communities where computer access at work or home is highly limited.
Political and Religious Access	Certainly, democratic political regimes enable faster growth of the Internet than authoritarian or totalitarian regimes. The Internet is considered a form of e-democracy, and attempting to control what citizens can or cannot view is in contradiction to this. Religious beliefs denied many (mostly women) the ability to access certain websites and disseminate information. There are limits to the television channels that could be accessed in some homes.
Cultural Access	Bridging the digital divide is not sufficient, but the images and languages needed to be conveyed in a language and images that can be read across different cultural lines. A study noted how participants taking the survey in Spanish were nearly twice as likely not to use the internet (Pew Research Center, 2013). There are similar circumstances in many cultures.
Energy and Power Access	Undoubtedly, energy and power are required to energize the facilities and amenities. However, this is not readily available. Energy from the national grid runs 24/7 in less than 1% of homes and states of the country; and it is very costly. Alternatives are generated by individuals and groups with high safety risk and cost.
Others (Specified)	High level of insecurity of lives and properties, low level of literacy, willingness of individuals, groups and governments cannot be over-emphasized.

Table 4 is an array of the measures of digital divide. None of the factors are promising. Disparities between individuals, households, businesses, or geographic areas, usually at different socioeconomic levels or other demographic categories is very high. The level of

availability of emerging technologies such as Artificial Intelligence, robotics and Internet of Things (IoT) is unacceptable. Community social capacity, economic disparity, demographic differences and education is low. High-quality computers with improved education that can lead to higher wages is very low. Access to goods and services available through technology is very low. See Table 4.

Table 4

A measure of factors of digital divide *****

Factors Measured	Prevalent Likert Scale Measured
High-quality computers with improved education that can lead to higher wages	Very Low
Affordable, robust broadband internet service; internet-enabled devices that meet the needs of the user; access to digital literacy training; quality technical support; and applications and online content designed to enable and encourage self-sufficiency, participation and collaboration	Very Low
Access to goods and services available through technology	Very Low
Emerging technologies such as Artificial Intelligence, robotics and Internet of Things (IoT)	Unacceptable
Information accessibility, information utilization, and information receptiveness – accessibility individuals need to know how to make use of the information and communication tools once they exist within a community	Very Low
Ability to learn and grow in low-income learning communities	Very Low
Community social capacity, economic disparity, demographic differences and education	Low
Disparities between individuals, households, businesses, or geographic areas, usually at different socioeconomic levels or other demographic categories.	Very High
Telephone services including mobile telephone, e-community and social-networking, e-commerce to electronic readers and electronic rendering of government services, and others	Low
"Net benefit" (optimal help minimal harm) as a result of the impact of a spreading digital economy	Very Low

Note: ***** Measures are based on Very High, High, Average, Low, Very Low and Unacceptable

Since the early 21st century, there have been many Internet services in use (Polson, 1993; Talebian et al., 2014; Todd, 2012; Toro & Joshi, 2012). They are not yet widely available in developing communities. Some are listed in Table 5 with an estimate of the status of availability and usage of each. These range from mobile telephone, e-community and social-networking, e-commerce to electronic readers and electronic rendering of government services, and others. The most used are mobile phones and electronic communication devices (54%). Price engines like Google Shopping, which help consumers find the best possible online prices and similar services like ShopLocal which find the best possible prices at local retailers is used by just about 10%. About 25% use Online research systems like LexisNexis and ProQuest which enable users to peruse newspapers, magazines, articles, and journals that may be centuries old, without having to leave home or office. See Table 5.

Table 5

Internet services

Internet/Digital Services	Aver. of Estimated Status (%)	Generic Comment
In tandem with the norms, mobile phones, and electronic communication devices	54	Only in urban areas; few in rural setting; learners have limited services – often used for entertainment
E-communities and social-networking	19	Most common among learners; and in banking and finance sector
Fast broadband Internet connections, enabling advanced Internet applications	23	In Banking and Finance. Limited in learning centers except cybercafes, and at a high fee
Affordable and widespread Internet access, either through personal computers at home or work, through public terminals in public libraries and cafes, and through wireless access points	24	Too costly for majority of individuals; learners /instructors rarely think of it
E-commerce enabled by efficient electronic payment networks like credit cards and reliable shipping services	32	Uncommon among learners. Limited to the affluent business men and women
Virtual globes featuring street maps searchable down to individual street addresses and detailed satellite and aerial photography	24	Partially in few urbanized areas not commonly used for teaching and learning
Online research systems like LexisNexis and ProQuest which enable users to peruse newspaper, magazine articles and journals that may be centuries old, without having to leave home or office	25	Accessibility is minimal and only on few academic campuses; and not reliable
Electronic readers such as Kindle, Sony Reader, Samsung Papyrus and Iliad by iRex Technologies	21	Not common; and not known to many
Price engines like Google Shopping which help consumers find the best possible online prices and similar services like ShopLocal which find the best possible prices at local retailers	10	Not known to most people and used by only few lecturers/instructors
Electronic services delivery of government services, such as the ability to pay taxes, fees, and fines online	13	Often, government services and programmes remain one-on-one
Further civic engagement through e-government and other sources such as finding information about candidates regarding political situations	15	Democratic ethos is low; and e-government is not in practice
E-learning	25	Both learners and instructors/teachers are groaning in inadequacy of facilities and amenities

The divide has some specific impacts on education and adult education in particular: People without access to the Internet and other information and communication technologies are disadvantaged, as they are unable or less able to teach or learn online, shop online, search for information online, or learn skills needed for technical jobs, and others. There is also a reverse divide: poor and disadvantaged learners spend more time

using digital devices for entertainment and less time interacting with people face-to-face compared to the well-off families.

Explicitly, with adult education, the digital divide impacts ability to learn and grow among low-income families and communities. Without Internet access, learners are unable to cultivate necessary tech skills in order to understand contemporary dynamic economy when instructors/lecturers give learners homework that demands access to broadband. Learners use the Internet to complete assignments as well as connect with teachers and other learners via discussion boards and shared files; and many could not get a computer to use as identified with some American families by McLaughlin (2016).

Conversely, and as observed for the United States by Bowles (2018), affluent families, especially the tech-savvy, carefully limit learners' screen time. Wealthy families attend play-based educational programmes that emphasize social interaction instead of time spent in front of computers or other digital devices. Table 6 is a 6-level Likert Scale that measures the severity of the impacts. "Very severe impacts" is 64%. "Very severe impact," "Severe impacts," "Impact" put together is huge, 96%. "Mild impact" is 0%. "No impact" is only 4%. "Don't know" is also 0%. See Table 6.

Table 6

Likert Scale of the adverse impact of digital divide on adult education in Nigeria

Level of impact	Frequency	% Proportion	Cumulative %	Inverse Cumulative. %
Very severe impact	16	64	64	100
Severe impact	6	24	88	36
Impact	2	8	96	12
Mild impact	0	0	96	4
No impact	1	4	100	4
Don't know	0	0	100	0
Total	25	100		

The digital divide has to be bridged by targeting an "Information Community/Society" (Anurugwo, 2020; Stantchev et al., 2014; Talebian et al., 2014; World Submit on the Information Society, 2003). Table 7 summarizes the strategies, namely: Turning digital divide to digital opportunity; a common vision about ICT for all; empowerment of women in the information community; evolving special needs for the marginalized and vulnerable society; generic resolute empowerment; attention to indigenous and cultural heritage; priority attention to characteristic economy in transition; connectivity as central to enabling agent; creation and dissemination of scientific and technical information; and avoidance of, and refrain from, unilateral measures not in accordance with international and national law and charters. Table 7 gives a description of these.

Table 7

Strategies for bridging the digital divide for sustainable adult education in Nigeria

Strategy	Detailed Description
Turning digital divide to digital opportunity	Full commitment by governments, learning institutions and individuals to turning digital divide into a digital opportunity for all, particularly for those who risk being left behind and being further marginalized
A common vision about ICT for all	Total commitment to realizing a common vision of the Information Community for the present and future generations. Young people are the future workforce and leading creators and earliest adopters of ICTs. They must be empowered as learners, developers, contributors, entrepreneurs and decision-makers. Special focus needs be given to the youth who have not yet been able to benefit fully from the opportunities provided by ICTs. The development of ICT applications and operation of services should respect the rights of children as well as their protection and well-being
Empowerment of women in the information community	Development of ICTs will provide enormous opportunities for women, who should be integral part of and key actors in the Information Community. The Information Community should enable women's empowerment and their full participation on the basis on equality in all spheres of society and in all decision-making processes. Gender equality perspective and ICT's use as a tool to that end should be mainstreamed
Evolving special needs for the marginalized and vulnerable groups	In building the Information Community, particular attention should be paid to the special needs of marginalized and vulnerable groups of the society, including migrants, internally displaced persons (IDPs) and refugees, unemployed and underprivileged people, minorities and nomadic people, and people with disabilities.
Generic resolute empowerment	Resolute empowerment of the poor, particularly those living in remote, rural and marginalized urban areas, to access information and to use ICTs as a tool to support their efforts to boost themselves out of dearth
Attention to indigenous and cultural heritage	Particular attention must be given to the special situation of indigenous peoples, as well as to preservation of their heritage and cultural legacy
Priority attention to characteristic economy in transition	Pay attention to the generic needs of the developing country, (with economy in transition, highly indebted poor country, under occupation, recovering from conflict with special needs, and experiencing severe threats to development
Connectivity as central to enabling agent	Connectivity should be a central enabling agent in building the Information Society. The challenges of universal, ubiquitous, equitable and affordable access to ICT infrastructure and services should be the focus of all stakeholders involved in bridging the divide. The connectivity will also involve access to energy and postal services, which should be assured in conformity with the national and state legislation
Creation and dissemination of scientific and technical information	Promotion of universal access with equal opportunities for all to scientific knowledge and the creation and dissemination of scientific and technical information, as well as open access initiatives for scientific publishing
Avoidance of, and refrain from, unilateral measure not in accordance with international and national law, and Charters	States should take steps with a view to the avoidance of, and refrain from, any unilateral measure not in accordance with international and national law, and Charter of the United Nations that impedes the full achievement of economic and social development by the population of the affected country, and that hinders the well-being of the population

Further detailed discussion on these is beyond the scope of this work but, literatures have further argued on why it is important to "bridge the gap" (Hilbert, 2011; 2016; Internet World Stats, 2014): for social mobility, healthy democracies, economic growth and equality, ameliorating demographic differences, educational and literacy differences, enhancement of social and cultural capital, addressing economic disparity, and for bridging the gap between the rural and urban livings, that is beyond specific needs in engendering sustainable adult education. Also, Dintsis (2014), Pavel et al. (2015), Rao

(2014), and Aderogba (2015; 2020) have all observed that the ICT has tremendous educational advantages as it: enables effective education; provides instruction according to student needs; provides educational activities in large geographical areas; encourages individual study; world-wide access to the best teachers, universities and other educational institutions, etc.; real-time updates of training content; fast feedback; virtual collaboration; enhanced control of teacher's qualification and training materials; sharing experiences; increased access; flexibility of content and delivery; combination of work and education; learner-centered approach; and higher-quality of education and new ways of interaction among others.

Similarly, in literature, relevant ICT tools for holistic bridging digital divide and for effective teaching and learning have been identified and classified into: Informative tools - Internet, Network Virtual Drive, Intranet systems, Homepage, etc.; Resignation devices - CD-ROM, etc.; Constructive tools - MS Word, PowerPoint, FrontPage, Adobe Photoshop, Lego Mind storm, etc.; Communicative tools - e-mail, SMS, etc.; and Collaborative tools - discussion boards, forum, etc. (Aderogba, 2015; 2020; Aderogba & Adeniyi, 2020; Anurugwo, 2020; Lim & Tay, 2003).

Conclusion

The digital divide in the developing world is humongous – very wide; and there is nothing to show that it will get bridged so soon. Adult education is directly and indirectly impacted. The work has been able to identify some strategies towards bridging the divide, namely: turning digital divide to digital opportunity; a common vision about ICT for all; empowerment of women in the information community; evolving special needs for the marginalized and vulnerable groups; generic resolute empowerment; priority attention to indigenous and cultural heritage; priority attention to characteristic economy in transition; connectivity as central to enabling agent; creation and dissemination of scientific and technical information; and avoidance of, and refrain from, unilateral measure not in accordance with international and national law and Charters.

Challenges facing adult learners in the face of technological innovations such as lack of literacy which hinders the use of technological tools (computer and computer accessories), Internet, exposure to technological tools, fear of use, and lack of digital literacy need priority attention. These are true of Nigeria and other countries in the developing worlds.

Recommendations

Concerted efforts need to be made within the next decade by concerned bodies to restructure curriculum and textbooks of both adult education and formal schools as a means of reconciling theoretical knowledge with practical knowledge, which is the essence of technology. Also, within the spate of five years, e-learning should be introduced into, at least where practicable, all formal adult education programmes to foster e-services in all its ramifications in cities and towns and in every facet of human endeavour in the society.

It will not be out of place for all levels of government to invest massively in computer and computer accessories with a view to ensure, at least, a computer per household. A substantial part of the 26% of the national budget on education, as recommended by UNESCO, could be expended on computer, computer accessories and Internet connectivity.

Adult education teachers/instructors should be provided with a consistent training programme for e-learning pedagogy; and the curriculum objectives should focus on the use of technology for teaching and learning in and outside of the classroom. E-learning instruction should align with learners' specific learning goals. To overcome barriers to e-learning, programme stakeholders must be committed to expanding the solutions with the expectations that e-learning has the ability to serve effectively, and to every level of education, adult education typically and especially inclusive.

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